

**Pollution Prevention Opportunity Assessment  
for Targeted EPA-17 Toxic Chemicals and Hazardous Waste Streams**

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Under contract to Headquarters, Air Force Center for Environmental Excellence (HQ AFCEE), Earth Tech, Inc. (Earth Tech), has prepared this Opportunity Assessment (OA) to develop a detailed report that assesses the status of actions that have been, will be, or could be implemented at Pacific Air Force (PACAF) installations to further reduce or eliminate the use of hazardous materials and the generation of hazardous waste. This effort was accomplished through suggested chemical and process substitutions, minimization of hazardous chemicals or processes, reuse or recycling, or a combination thereof. The OA focused on identifying and validating environmentally friendly alternatives for targeted processes that use the greatest amount of U.S. Environmental Protection Agency (EPA) Industrial Toxic Pollutants (ITP), also known as EPA-17 toxic chemicals, and contribute the most to the generation of hazardous waste. Table 1 lists the EPA-17 toxic chemicals.

**Table 1. EPA-17 Toxic Chemicals**

Organic Toxic Chemicals	Chemical Abstract No.
Benzene	71-43-2
Toluene	108-88-3
Xylene	1330-20-7
Carbon Tetrachloride	56-23-5
Chloroform	67-66-3
Dichloromethane	75-09-2
1,1,1 Trichloroethane	71-55-6
Trichloroethylene	7-01-6
Perchloroethylene	127-18-4
Methyl Ethyl Ketone (MEK)	78-93-3
Methyl Isobutyl Ketone	108-10-1
Inorganic Toxic Chemicals	
Cadmium and compounds	7440-43-9
Chromium and compounds	7440-47-3
Cyanides	varies
Lead and compounds	7439-92-1
Mercury and compounds	7439-97-6
Nickel and compounds	7440-02-0

The OA provides the PACAF installations with a tool to support compliance through pollution prevention (P2), and to provide a mechanism for cross feeding information among the PACAF installations. Effective implementation of P2 opportunities requires coordination and focused efforts on the part of all Air Force personnel involved in handling or generating hazardous materials/waste.

The processes in which EPA-17 chemicals are used, and hazardous waste streams selected for evaluation in the OA, include:

#### EPA-17 Chemical Processes

- Aircraft painting
- Aerospace Ground Equipment (AGE) painting
- Solid film lubricant
- Methyl Ethyl Ketone (MEK) as a wipe solvent
- Aerosol paint alternatives
- Cleaner, lubricant, and preservatives
- Corrosion preventative compounds
- Miscellaneous hazardous materials alternatives.

#### Hazardous Waste Streams

- Absorbents
- Paint wastes
- Naphtha/PD-680
- Blasting media
- Jet washer rinseate
- Excess hazardous materials
- Paint filters
- Rags containing MEK
- Batteries.

Prior to identifying options and alternatives, the root cause for each EPA-17 process or hazardous waste stream was identified. Once the root cause was identified, alternatives were developed to eliminate or reduce the source. Options and alternatives were first screened to determine whether there is justification for carrying them forward for further evaluation. Those that survived the screening process were evaluated for technical and economic feasibility, and for their impact on the baseline for hazardous materials use and disposal. The options and alternatives considered the EPA P2 hierarchy (reduce, reuse, recycle) and source reduction techniques, including:

- Substitution
- Product reformulation
- Process change or modification
- Process upgrade/update
- Improved operation and maintenance
- Recycling.

This study was conducted during the summer of 1997. In some instances, the evaluation was inconclusive because an acceptable substitute could not be identified, or the potential use could not be confirmed. Additional information may now be available to confirm a product or verify its non-applicability. A flow diagram for identifying alternative products is presented in Figure 1.

A summary of results and conclusions for the processes that utilize EPA-17 toxic chemicals or generate hazardous waste that were considered in the OA, and associated options and alternatives identified, are provided below.

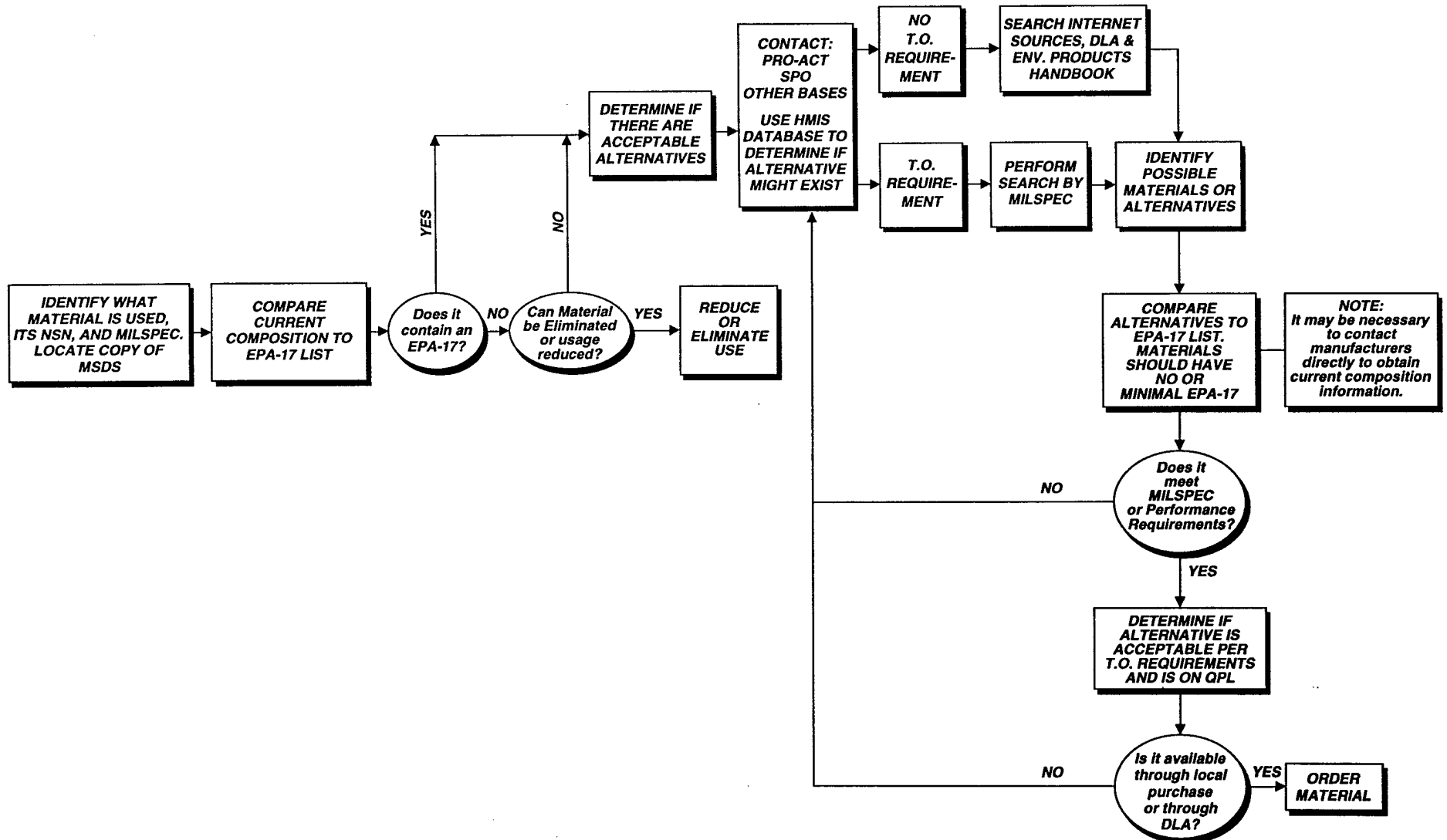
#### **EPA-17 Toxic Chemicals**

Seven specific processes were considered in the OA that utilize EPA-17 toxic chemicals. In addition, one miscellaneous category was considered for general hazardous material usage in the shops.

#### Aircraft Painting

- 11 options considered

**Figure 1. Identify Alternative Products**



- 4 were recommended for immediate implementation without further evaluation:
  - Better calculation in mixing ratios
  - Better estimate of amount of paint needed
  - Train personnel on new technologies and reduction techniques
  - Use paint pot liners
- 3 were evaluated in further detail:
  - Use a substitute paint (no substitute for polyurethane currently identified)
  - Use unicoat paint technology
  - Use paint proportioning system

#### Aerospace Ground Equipment Painting

- 10 options considered
- 5 were recommended for immediate implementation without further evaluation:
  - Minimize area to be painted
  - Better calculation in mixing ratios
  - Better estimate of amount of paint needed
  - Train personnel on new technologies and reduction techniques
  - Use paint pot liners
- 3 were evaluated in further detail:
  - Use a substitute paint (0 substitute paints currently identified)
  - Use unicoat paint technology
  - Use paint proportioning system

#### Solid-Film Lubricant

- 3 options considered
- 1 was evaluated in further detail:
  - Use a less toxic chemical (none found, bulk application recommended)

#### MEK as a Wipe Solvent

- 3 options considered
- 2 were evaluated in further detail:
  - Use a substitute chemical
  - Use a less toxic chemical (13 substitute/less toxic cleaners identified)

#### Aerosol Paint Alternatives

- 7 options considered
- 3 were evaluated in further detail:
  - Use a paint stick instead of aerosol
  - Use low-VOC, high solid paint
  - Use vinyl lettering

#### Cleaner, Lubricant, and Preservative

- 2 options considered
- 1 was evaluated in further detail:
  - Use non-EPA-17-containing product (7 substitute products identified)

#### Corrosion Preventative Compounds

- 2 options considered
- 1 was evaluated in further detail:
  - Use non-EPA-17-containing product (21 substitute products identified)

#### Miscellaneous Hazardous Materials (lubricating oil, brake part cleaner, edge sealer)

- 3 options considered
- 3 were evaluated in further detail:

- Use substitute general purpose lubricating oil (11 substitute products identified)
- Use substitute brake part cleaner (9 substitute products identified)
- Use substitute edge sealer (1 substitute product identified)

## **Hazardous Waste Streams**

Nine hazardous waste streams were considered in the OA.

### Absorbents with Fuels/Oils

- 11 options considered
- 6 were recommended for immediate implementation without further evaluation:
  - Repair leaking equipment
  - Establish routine maintenance procedure to check for leaks
  - Monitor filling of tanks to minimize spills
  - Modify work procedures to minimize cleanup requirements
  - Use minimum quantity of sorbent required
  - Segregate sorbents
- 4 were evaluated in further detail:
  - Use a non-explosive wet vacuum
  - Burn sorbents for energy recovery
  - Compact sorbents to reduce volume and for waste oil recovery
  - Use higher-absorbency material

### Paint and Paint Thinner Waste

- 10 options considered
- 7 were recommended for immediate implementation without further evaluation:
  - Discontinue routine use of solvent-based paint
  - Use remaining solvent-based paint for non-critical purposes
  - Develop written specifications for painting preparation
  - Evaluate procedures used to determine when to paint and how much paint to use
  - Use high-volume, low-pressure paint system
  - Better calculation in mixing ratios
  - Segregate solvents from paint
- 2 were evaluated in further detail:
  - Use substitute for solvent-based paint (no substitute for polyurethane currently identified)
  - Use plural-component system for two-component painting

### Naphtha/PD-680 Waste

- 6 options considered
- 3 were recommended for immediate implementation without further evaluation
  - Install jet washers with biodegradable solvents
  - Discontinue use of solvent-based cleaners
  - Modify parts washers that use naphtha and PD-680 as necessary

### Blasting Media

- 10 options considered
- 1 was recommended for immediate implementation without further evaluation:
  - Recycle blast sand
- 2 were evaluated in further detail:
  - Use blasting media other than sand, such as steel grit, glass bead, or Emerald Creek garnet
  - Use Blastox with sand

### Jet Washer Rinseate

- 6 options considered

- 3 were recommended for immediate implementation without further evaluation:
  - Use less harsh cleaner
  - Evaluate basewide use of jet washers for consolidation of use
  - Evaluate operating procedures (time, detergent volume) to reduce metal recovery

#### Excess Hazardous Materials

- 5 options considered
- 5 were recommended for immediate implementation without further evaluation:
  - Inform personnel of non-hazardous substitutes
  - Develop written specifications for quantity of material required
  - Stock appropriate quantities of materials
  - Reuse leftover materials
  - Screen out unnecessary local purchases of hazardous materials

#### Paint Filters

- 6 options considered
- 4 were recommended for immediate implementation without further evaluation:
  - Discontinue dissolving styrofoam filters in MEK
  - Test filters before disposal to ensure they are hazardous waste
  - Develop written specifications for selection of paint filters
  - Develop written specifications for filter change-out procedures
- 1 was evaluated in further detail:
  - Segregate metal-based and non-metal-based paint operations

#### Rags with MEK

- 4 options considered
- 1 was recommended for immediate implementation without further evaluation:
  - Require written, performance-based technical justification for MEK use
- 2 were evaluated in further detail:
  - Use substitute chemical (13 substitute/less toxic cleaners identified)
  - Compact rags to reduce volume and to recover solvent

#### Batteries

- 3 options considered
- 2 were recommended for immediate implementation without further evaluation:
  - Convert from lead-acid to gel-cel batteries
  - Convert to rechargeable batteries

#### **Conclusions**

Significant reductions in the use of hazardous chemicals and the generation of hazardous waste streams are possible through chemical and process substitutions, minimization of hazardous chemical use, reuse or recycling, personnel training, or a combination thereof. Because new chemicals and products are constantly being developed, the P2 process must be ongoing. Important sources for continuing study include System Program Office (SPO) technical personnel, Hazardous Material Information System (HMIS) CD-ROM databases, vendors, Defense Environmental Network and Information Exchange (DENIX), PRO-ACT, EPA EnviroSense Bulletin Board, Technical Information in Pollution Prevention Systems (TIPPS), and Defense Technical Information Center (DTIC).